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Seasonal variation in heavy-metal accumulation in honey bees as an indicator of environmental pollution

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Abstract

Determination of contaminants in biological objects is one of the most important aspects of environmental health control. The objective of this study was to investigate heavy metals accumulation in bees at different seasons in areas with different degrees of technogenic pollution. The concentrations of six microelements in 36 honey bee samples taken from uncontaminated and contaminated environments were analyzed by atom-absorption spectrometry. The contents of heavy metals in bee samples differed significantly by season and location. Cadmium and manganese were found in higher concentrations in summer bees from contaminated apiaries than in autumn ones. On average, levels of cadmium, lead, manganese in contaminated areas exceeded those in control areas by 3.3, 4.5, 2.3 times respectively. There was no discrepancy found in concentration of heavy metals between summer and autumn bees from control apiaries. The index for evaluation of degree of technogenic contamination with used concentrations in different seasonal generations was proposed (ratio of heavy metal concentration of summer and autumn bee generations collected from the same colony). Therefore, honey bees can be used to evaluate contamination in terrestrial ecosystems.

Keywords

Apis mellifera, Atom-absorption spectrometry, Bioindication, Seasonal generations